

## PIARC C13 meeting, Lisbon April 2003

### *The Safety Audit of Existing Roads*

By Ian Appleton, Working Group A

#### **Purpose**

The purpose of this paper is to describe a variety of activities that might be described as a safety audit applied to an existing road or network, and to provide clarity on these terms.

#### **What is Road Safety Audit?**

*“A road safety audit is a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project’s crash potential and safety performance.”*

This is the definition from the Austroads *Road Safety Audit Guide*, second edition, published in 2002.

This, and other definitions, recognise that there is a role for applying the safety audit principles to an existing road or network. Other definitions specifically exclude the safety audit of existing roads.

#### **Brief history**

Road safety audit had its origins in the United Kingdom in the 1980s, following the development of Accident Investigation and Prevention (AIP) techniques and the requirements of successive legislation for highway authorities to take steps to reduce the possibility of accidents on their roads. A brief history is provided at Appendix A.

#### **Current Use**

Formal safety audit procedures have been developed in a number of countries, following the initiatives taken in the UK. During the early 1990s, work was carried out in Australia, Denmark and New Zealand. Since then, national and local governments Canada, France, Greece, Hong Kong, Iceland, Ireland, Italy, Malaysia, the Netherlands, Portugal, Singapore, the USA and others have been investigating the development of road safety audit. Some countries have prepared national guidelines, and have formally adopted road safety audit as a national policy.

## Road Safety Audit of existing roads.

### **Introduction**

Most, but not all, countries that have adopted road safety audit started with the audits of projects. Only some countries have moved onto the audits of the existing networks. These audits are not so well understood as project audits and there are a variety of methods that only help to confuse.

There are many words in use to describe these audits, for example:

- Safety audit of existing roads
- Safety Reviews
- Safety Assessments
- Safety Inspections

Perhaps the different words are used to describe processes with different purposes. At one end of the spectrum the audit may be used to provide a general overview of the adequacy of the safety provisions provided an authority. Recommendations from such an audit would be addressed to policy matters. At the other end of the spectrum, the audit might be used to identify very specific maintenance issues that results in a schedule of items for the maintenance contractor. One would have to ask whether the latter is truly an audit.

There is a variety of methods for conducting these audits, for example, is a sample of roads chosen and how is that sample drawn or are all roads examined? A key component of the methodologies is the use of data – what is recorded and how is it reported?

### **Benefits of Road Safety Audit**

Many countries adopted road safety audit without objective evidence that it was an effective road safety programme. It was believed to be so.

Austrroads commissioned ARRB Transport Research to undertake an investigation to determine the economic value of road safety audit. A literature review identified only four studies that quantified the economic benefits of road safety audit. Two studies from England, and one each from Denmark and Jordan used different methodologies but all found economic benefits. None of these studies considered the audit of existing roads.

The Austrroads research report (AP-R209/02) states:

*“The evaluation of the proposed actions emanating from existing roads audits resulted in the following findings:*

- *The analysis of a range of existing roads audits indicated Benefit to Cost Ratios (BCRs) between 2.4:1 and 84:1, when considering the value of completing the proposed actions identified in response to the audit findings.*
- *The BCRs of individual proposed actions within existing road audits ranged between 0.003:1 and 460:1.*
- *Over 78% of all proposed actions had BCRs > 1.0.*
- *Approximately 47% of all proposed actions had BCRs > 5.0.*

- *Over 50% of all proposed actions had a cost < \$5,000. 87% of these actions had BCRs > 1.*

The report provides similar results for design stage safety audits. The economic returns from design stage audits are greater than for existing roads audits.

### **Review of Road Safety Audit Guides and Reports.**

The author has undertaken a review of a number of guides and reports to gain a picture of the use of existing roads audits worldwide. The review is detailed in Appendix B.

The issues raised from this review are:

- Numbering of stages of audit
- Audit versus monitoring
- Change name
- Relation to accident investigations studies
- Types of audits
- Data & judgement
- Techniques
- Reporting

#### **Numbering of stages of audit.**

Most guides recommend audits of schemes be undertaken at four stages. However, there have been different ways to number the stages and therefore the author recommends that the numbering system be abandoned and audits be referenced in words e.g. Feasibility stage.

In this numbering system, the safety audit of existing roads was called a “Stage 5” audit. This created confusion as it gave the impression that a stage 5 audit was simply the next audit to be completed after a stage 4 audit. This was not the case. An audit of an existing road is different from a project audit. In the author’s opinion, an audit of an existing road is so different from an audit of a project, that it should not be included in the same guide.

#### **Audit versus monitoring**

Some guides include a requirement to monitor a scheme for some months or years post-construction. Crashes occurring on the new scheme can be monitored, and user behaviour observed. However, this activity still relates to the scheme and can be called a post-construction stage of the audit. It is not an audit of an existing road.

If a particular manual uses a numbering system for the stages of audit, then the post-construction stage can reasonably be given the next stage number after the “pre-opening “ stage.

#### **Change the name**

For two reasons the author proposes that the word “audit” is not applied to existing roads. The first reason is that there are a variety of activities applied to existing roads. There is a danger that the word “audit” will be applied to an activity that is not an audit, thereby downgrading the status of audits. The second reason is the potential confusion between audits

of projects and audits of existing roads. The author proposes that the word “review” be used for existing roads.

### **Road Safety Review versus Accident Investigation**

A frequent question is “why do I need to do a safety review, when I do accident investigation studies?” The two are different but complementary programmes. A safety review is a proactive programme; it aims to identify road features that will contribute to future accidents. Accident Investigation is a reactive programme, it examines past accidents and aims to remove or change the features that contributed to those past crashes.

Accident investigation studies tend to concentrate on single locations, though the guides for accident investigation usually describe route studies, area studies and mass action plans. Sometimes accident investigation studies will identify a hazardous location from the crash data that is inherently the same as another location. The reason that one is investigated and the other is not may be just a matter of chance.

Safety reviews are more akin to mass action studies. Safety reviews identify features of the road environment that are known to increase the probability of a crash occurring or increase the severity of crashes. A programme can be developed to address this feature on a network wide basis.

Research has shown that accident investigation studies have a higher rate of return than safety reviews. This is to be expected as accident investigation studies result in focussed remedial works, whereas safety reviews try to raise the safety performance of the network generally.

Both programmes are worthwhile and are complementary, but need to be coordinated.

### **Different types of safety reviews**

While there is an international agreement on the procedure for conducting the safety audit of projects, there is no universally accepted way of conducting safety reviews of existing roads. Safety Audit Guides listed in Appendix B do not generally contain detailed procedures for safety reviews.

The key determinants of the review procedure are:

- Who commissions the review;
- The objectives of the review,
- The sampling of roads, and
- The presentation of the results.

The author commissions safety reviews for the funding agency in New Zealand. The objective is to form a view of the road controlling authorities’ performance. The results are presented as an overview and are pitched at a policy or programme level.

A road controlling authority can commission a safety review at several levels. At one level the objective is to develop generic network-wide programmes of improvements to particular road environment features. The procedures will involve the selection of a sample of roads to be reviewed, checklists of features to be surveyed, a means of recording and synthesising observations and a reporting regime. Results are presented as proposed area wide safety improvements.

At a second level, a safety review may be applied to a specific route.

At a third level, there are safety inspections, where every deficiency on the road is recorded. It is this activity that has caused some confusion in the past, possibly because of the presentation of data. Unless there is some processing of the data, reports of these inspections can become too long and unmanageable. Safety inspections may be used as maintenance inspections. The data can be coded and separated automatically and sent to the appropriate maintenance contractors.

### **Data versus judgement**

In presenting the results of safety reviews, the client will want to know how important are the issues raised. This is the same as the concern about safety audits of projects.

Some manuals, for example the Transfund safety audit of existing roads manual (“Safety Audit of Existing Roads” Transfund Report RA97/623S, 1998), provide some assistance. A matrix is provided on which one axis is exposure to risk (i.e. the frequency at which a crash is likely to occur) and on the other axis is the severity of the expected crash (e.g. fatal, serious, minor). The cells of the matrix are filled with words like “Low”, “Medium” “High” level of importance.

These tables can be used to provide the client with an indication of how important is the identified safety issue. However, the use of the table is not robust, because there is very little data on which to make the judgement. Thus the table is really no more than an aid to help the review team come to a considered judgement.

The fact that the results of the review are a matter of judgement does not downgrade the value of the safety review. However caution must be exercised if the results of one safety review are compared with another. There is no guarantee that two different review teams reviewing the same network will come up with exactly the same results. The matter is further compounded if different teams review different networks.

To overcome this difficulty the safety reviews must be made more objective. Data are available on the safety performance of individual road features. The challenge is to use these data and develop a practical tool for review purposes. Work has started in some countries to meet this challenge.

On the other hand, accident investigations are data driven. The manuals for accident investigation stress the requirement to use the accident data to identify hazardous locations or routes. The analysis of accident data aims to identify trends and then seeks to find the features of the location that contribute to the occurrences of accidents. There is less reliance on judgement in accident investigation than in safety review because the frequency of accidents is known.

Accident investigators may well dispute the above paragraph, with some justification, because the accident records are far from complete, not only in coverage, but also in detail. The number of injury crashes reported in the official statistics may be well below the actual number. In New Zealand, in 1999-2001, approximately 35-45% of hospitalised road crash casualties were not reported to the Police.

In countries with poor accident statistics, the role of safety reviews becomes more important.

### **When do I look at the accident data?**

This is a frequently asked question on training courses for safety review. The question lies at the heart of the difference between safety review and accident investigation. The latter is clearly led by the accident data, but the purist would say that the accident data should not be examined prior to a safety review.

Engineers conducting safety reviews are not agreed on this question. All agree that the accident data should not be examined in detail, otherwise one might as well do an accident investigation. Some take the purist view that the accident data should not be seen. Others are a little more pragmatic and believe that an overview of accident data will assist the review by providing information on the main trends in accident occurrence. What are the main types of crashes happening on this network?

Again, others believe that the accident data should be examined only after the review has been completed. The belief is that the findings of a safety review should be reflected in the accidents happening on the network. Such a post-review examination may be helpful in assessing the methodology of the review. With hindsight, would one expect a safety review to pick up features that contribute to a certain type of accident? Conversely, does the review identify features that appear to have no connection with the accidents that do occur? In New Zealand, we have conducted these post review examinations of accident data and these have led to a modification in the way we assess potential hazards.

### **Should I drive at normal speed during safety reviews?**

The author's opinion is "Yes" – the roads needs to be seen from the road users' perspective. There is a trade-off with the ease of observation. At normal traffic speed, there is a possibility that certain features may be missed. In addition, if the recording of information is on a survey form, then some information will be lost when the survey form is marked. There are a number of ways to deal with this. For example, one run maybe made at normal speed and a second run at slower speed. Travelling at less than the operating speed does present a problem for following vehicles that will wish to overtake.

Since the safety review is taken from the road users' view, then the survey team must take notice of all roads users present. This means that the team must get out and walk where there are significant numbers of pedestrians. In theory the review should be done on a truck, on a motorcycle, and on a bicycle. However, this is not really practical, unless there are significant numbers of a particular road user.

The road users' perspective includes different manoeuvres, different weather conditions, and day and night driving. The first means that some intersections need to be driven in all directions, and the methodology should include drives in the hours of darkness. As for the weather conditions, these are less predictable. The organisation of a team to conduct a safety review will probably mean that the dates for the review are set in advance; the weather will be what it will be.

### **Sampling**

In some types of safety reviews, there is a need to select a sample of roads to be surveyed. This will depend on the purpose of the review, as noted above. Where the purpose is to provide an overview of safety provisions, there is no need to survey all the roads, nor is it

practical. Provided that a representative sample is taken, then the expectation is that what the team observe on the sample of roads will be generally applicable everywhere.

For a sample to be representative, the team needs to consider the following:

- Road hierarchy
- Traffic volumes
- Terrain type and
- Land Use.

The sample should be stratified i.e. a greater proportion of roads at the top of the hierarchy should be sampled than those at the bottom of the hierarchy. While there may be some statistical techniques that might be applied, the sample is generally selected pragmatically to fit in with the time set aside for the review.

Where the client wishes to review a specific route or routes, then there is no need for sampling.

### **Reporting**

This is the most critical part of the review. The results must be presented in a manner that the client can manage. If this is not done, then the report will be ignored and the process discredited. Equally, there is little point in making recommendations that the client does not have the budget to implement. The review team must contain people who have the experience to know what is practical and what is not.

The report format and content should reflect the purpose of the review. For example, in a review of a whole network, the recommendations should be pitched at the policy and programme level. An example might be, in an urban network with inconsistent street lighting, “Consider developing a policy for the level of street lighting appropriate to each level of road hierarchy and develop a programme to implement that policy”. It will then be up to the client to determine, given resource constraints, how long such a programme might take.

The details of the roads sampled are not essential to the report but could be added as an appendix.

In the case of the detailed safety inspection, the detailed findings can be sent to the appropriate maintenance contractors. The client need only receive a brief summary overview. It would be useful for the client to see data tracking the number of items identified over time, divided into deficiency types. This will provide the client with an assessment of the performance of the maintenance contractor. In fact, one might expect the maintenance contractor to undertake the safety inspections themselves. The client can then commission an independent safety inspection at random as part of the monitoring of contractors’ performance.

### **Conclusions**

In this paper the author has described a range of activities that might be called the “Safety Audit of Existing Roads”

Austroroads research into the benefits of safety audits found that the audits of projects provided greater benefits than the audits of existing roads. Nevertheless audits of existing roads still provide positive benefits.

The author reviewed a number of guides and reports to gain a picture of the use of existing roads audits. The conclusions of this review are that:

- Existing roads audits should not be called a stage of an audit, because the two types of audits (existing roads & project audits) are completely different.
- Where a project safety audit includes an extra stage for monitoring a project 2 years (for example) after construction, then that monitoring can be called a stage of a project audit.
- Because of the confusion over the types of audits, existing roads audits should not be called audits; they should be called “road safety reviews”.
- A road safety review is not an accident investigation study. They are complimentary programmes; one is not a substitute for the other.
- Safety Reviews rely, at present, on the judgement of the review team, whereas accident investigation studies are driven by the accident data.
- There are several types of safety review from the overview of a whole network to a detailed maintenance inspection. The techniques used will depend on the type of review.
- Reporting the results of the review is critical and should reflect the purpose of the review.

### **Acknowledgement**

The author acknowledges the permission of Transfund New Zealand to present this paper. However, the opinions expressed in this paper are the author’s and do not necessarily reflect Transfund’s opinions.

## **Appendix A. Brief history of Road Safety Audit**

Road safety audit had its origins in the United Kingdom in the 1980s, following the development of Accident Investigation and Prevention (AIP) techniques and the requirements of successive legislation for highway authorities to take steps to reduce the possibility of accidents on their roads. AIP teams in County Councils, from initially investigating problems on existing roads with great success, turned their attention to preventing accidents on new road schemes. Formal processes were developed and in 1990 the Institution of Highways and Transport published its *Guidelines for the Safety Audit of Highways*. Those guidelines have since been revised in 1996.

In 1990 the Design Standard HD 19/90 and Advice Note HA 42/90 were introduced by the UK Department of Transport as part of the Design Manual for Roads and Bridges. This made safety audit mandatory on trunk roads and motorways schemes from 1991 onwards. In 2000 the UK Highways Agency commenced a thorough review of the UK safety audit practice with a view to a radical overhaul of the Standard and Advice Note.

Keen interest in road safety audit in New Zealand and Australia in the early 1990s saw the publication on the Transit New Zealand Manual in 1993 and the first edition of the Austroads Guide in 1994.

### ***Institute of Transport Engineers***

The Institute of Transport Engineers (ITE) produced an “Informational Report” in 1994, summing up the current status of road safety audit throughout the world. The ITE report confirmed that much of the safety audit expertise at the time was in the UK and Australasia. The ITE report noted that there was great scope for implementing road safety audits in developing countries, especially if they were linked to the infrastructure investments being made by funding agencies such as the World Bank.

### ***International Road Safety Audit Forum***

In 1998 Austroads hosted the first International Road Safety Audit Forum in Melbourne. The role for the forum arose from discussions among an international group of road safety audit managers who had identified common safety audit issues in several countries, and the need for a consolidation of experience into guidance for other countries. The Forum attracted 180 delegates from 14 countries. A central feature of the Forum was the drafting of a communiqué based on discussion emerging from the presentations and from more detailed feedback from the workshop sessions.

Road safety auditing was widely regarded as an important road safety management tool, and it is clearly in different stages of development in many countries. In the rapidly motorising countries, the safety audit approach has an important role and its implementation will benefit from lessons learned in other more experienced countries. The process is still evolving, even in the more experienced countries, and research efforts must continue to assist in refining the process and realising greater road safety benefits. For these reasons, an international network of practitioners in road safety audit is seen as a useful mechanism to spread information about the process, promote it and advance its adoption.

### **PIARC C13**

In the quadrennium 1996-99 the committee set up a working group on road safety audit, led by Lene Herrstedt of Denmark, comprising members from France, Hungary, New Zealand and Switzerland. The working group gathered information on current practice in different member states. The report to the World Road Congress in 1999 included experience from Denmark, New Zealand, France and the USA. The report has been published by PIARC in 2001.

Draft

## **Appendix B: Review of selected safety audit guides and reports for information on the safety audit of existing roads.**

The author has reviewed the safety audit guides and reports in his possession. He does not claim that this is a comprehensive review. It is limited to documents written in English.

### **Austrroads**

#### **Proceedings of the International Road Safety Forum in Melbourne 1998**

The forum attracted 180 road safety professionals from 14 countries. Several papers were devoted to the topic of existing roads audits and similar activities. One paper by Fred Schnerring specifically addressed the question “*Stage 5 Road Safety Audits – are they necessary?*”. The author concluded that they had a part to play so long as they did not duplicate accident investigation programmes and routine maintenance systems.

The Forum adopted a “Communique”, which states:

*“Road Safety Audit involves a specialist review of relevant designs or existing roads against safety principles.”* and

*“The road safety auditing of existing roads presents a special situation. Currently this is done differently in many jurisdictions, and there is debate about whether and to what extent accident investigation studies should be included in the process.”*

### **Austrroads**

#### **Road Safety Audit Summit 2001**

This was the second national forum to discuss developments on road safety auditing in Australia and New Zealand.

With regard to the use of the term “audit” in relation to Stage 5 (existing road) investigations, the following statements were supported:

*“The road safety audit process can be applied to the existing network – either in a route specific manner ... or in a network wide manner ..”*

*“The audit process when applied to existing roads is sometimes given a different name to emphasise the difference between design stage audits such as a review or assessment (e.g. road network review or road safety assessment)”.*

The output from this summit was used in the revision of the Austrroads Road Safety Audit Guide (see below).

### **Austrroads**

#### **Road Safety Audit Guide Second Edition 2002**

Austrroads is the association of Australian and New Zealand road transport and traffic authorities.

This guide recognises the role of the safety audit of existing roads. The definition is:

*“A road safety audit is a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project’s crash potential and safety performance.”*

The major part of the guide is devoted to the audit of projects, but one chapter is devoted to other types of safety audits and safety reviews.

*“The road safety audit process can be applied to the existing network – either in a route specific manner ... or in a network wide manner..”*

*“The audit process when applied to existing roads is sometimes given a different name to emphasise its difference to design stage audits, for example road network review or road safety assessment.”*

*“Safety audits of existing roads aim to identify any features which may lead to future crashes, so that remedial treatments may be implemented before crashes happen.”*

The guide discusses the relationship between road safety reviews and accident investigation programmes. The guide provides photographs of examples of review findings and a case study.

### **Federal Highway Administration (US)**

#### **Road Safety Audits and Road Safety Audit Reviews; August 2002**

This manual is the material for the National Highway Institute (NHI) course developed by Dr Martin Lipinski and Dr Eugene Wilson and sponsored by the FHWA and ITE. The material comprises a Participant Workbook, a Reference Manual and Instructor Guide.

The manual draws a distinction between *“Road Safety Audit ... is an examination of a future roadway ..”* and *“Road Safety Audit Review is an assessment of an existing roadway ..”*

*“A Road Safety Audit Review is performed on an existing roadway to determine if the safety needs of road users are currently being met. This review recognises that the use of a roadway might change over time. It may be performed:*

- *During the pre-opening stage of a new project to ensure that the safety concerns of all road users have been addressed,*
- *On a road section just open to traffic to evaluate its performance, or*
- *On an existing road to identify safety deficiencies.”*

## ***The Highways Agency (UK)***

### **Highway Design Standard Road Safety Audit (Draft 2002)**

At the time of writing this paper, the author had a copy of a draft 10, dated October 2002, of the Highways Agency standard on Road Safety Audit. The final version is due for release later in 2003. By including extracts from this draft, the author acknowledges that there is no guarantee that these extracts will appear in the final version.

The revision will supersede HD 19/94 and HA 42/94.

The definition clearly states that the standard applies to the road safety audit of “highway schemes”. It does not apply to existing roads. However the standard includes an increased emphasis on monitoring of completed schemes, as follows:

*“The audit process includes accident monitoring of schemes over a period of 36 months with analysis and reporting 12 months and 36 months after becoming operational to identify any problems that may have occurred since opening.”*

## ***Institute of Transportation Engineers (USA)***

### **Information Report Road Safety Audits February 1995**

The report defines a Stage 5 “In-Service”

*“This stage involves a systematic examination of sections of the existing road network to assess the adequacy of the road, intersections, road furniture, the roadside, and so forth, from an explicit safety viewpoint. This can have two applications – monitoring a new scheme after it is opened to traffic (that is, in the weeks and months following a Stage 4 audit), or a safety audit of an existing road or road network with a view to identifying safety-related deficiencies.”*

The report goes on to discuss the merits of such safety audits, as compared to accident investigation studies, and the “mass action” approach.

## ***Institution of Highways and Transportation (IHT) (UK)***

### **Guidelines for the Safety Audit of Highways Second edition 1996.**

This is the revision of the Safety auditors’ bible; the pink covered 1990 IHT Safety Audit Guide. The definition is:

*“Road Safety Audit is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes, and schemes for the improvement and maintenance of existing roads.”*

The guide concentrates on the audits of schemes. About existing roads, the guide states:

*“The role of road safety audit... needs to be recognised as distinct from that of accident investigation, which is pertinent to existing roads. Nevertheless, there may be a place for a*

*safety check of existing roads, using a similar methodology to that for road safety audit, as an extension to identification of safety problems based on accident data. For example, it could be an explicit part of route or area-wide action plans for accident reduction... to check for consistency of standards, features not compatible either road function, and users' perception of conditions to assist safer behaviour."*

### **JKR (Public Works Department (Malaysia))**

#### **Guidelines for the Safety Audit of roads and road projects in Malaysia (1997)**

This guide places more emphasis on the audit of existing roads than other similar guides. The definition is:

*"Road safety audit [is] the formal examination of the planning, design, and construction of road projects, and of the characteristics and operation of an existing road, by independent and qualified examiners, to identify any potential unsafe feature or operational arrangement that may adversely affect the safety of any road user."*

The guide calls audits of existing roads a "stage 5 audit" (Stages 1-4 being audits of projects).

*"Road safety audits are desirable on existing roads regardless of them having been audited during planning, design and construction. An audit at this stage will identify safety problems which develop due to normal 'wear and tear' from traffic operation. It will also identify hazards due to the way the landscaping has matured ... "*

*"The stage 5 audit differs from 'Black spot' identification and treatment in that it attempts to identify and correct potential problems before accidents occur due to them."*

The guide includes a detailed section on how to conduct safety audits of existing roads, with descriptions of what to look for with photographs, a case example and checklists.

### **PIARC – World Road Association**

#### **Road Safety Audits (2001)**

This is the report of the PIARC C13 Road Safety Committee presented at the World Road Congress in Kuala Lumpur in 1999. The definition of road safety audit is:

*"Road Safety Audit is a formal systematic road safety assessment of the road or road scheme carried out by an independent, qualified auditor or team of auditors who report on the project's accident potential for all kinds of road users."*

The report describes where Road Safety Audit can be used:

*"Road safety audit can also be applied to operating and maintenance activities on existing roads. Additionally, Road safety audit can be used on existing roads for a systematic assessment of road safety aspects."*

The report defines the stages at which audits can be done, and include:

*“Stage 5 Monitoring / Existing Road. Monitoring of roads after being laid out, or of existing roads to evaluate whether the road users make use of the layout as intended. New roads are inspected a few months after they are opened.”*

The report describes the results of a questionnaire survey of PIARC member countries. The report states:

*Some countries are mostly using reviewing for existing roads and some are in the process of developing a concept for Road Safety Audit on future roads. Other countries already use road safety audit for future roads and want to expand the systematic road safety assessment to existing roads.”*

The report concludes with examples of national experiences from Denmark, New Zealand, France and USA.

### **RoSPA (UK)**

#### **Road Safety Engineering Manual (2003)**

Chapter 6 of this manual is titled “Accident Prevention” and describes the audit of “highway schemes during design and construction.”. In a section titled “Road Safety Audit of existing roads”, the manual says:

*“Road Safety Audits of existing roads are carried out in some overseas countries and by a few highway authorities in the UK. This type of audit sets out to identify safety issues within the existing layout and use the expertise of safety engineers to highlight operational difficulties. This work is normally carried out in two phases. Firstly on site during a drive-through, and then the work moves to an office where the problems that have been identified are cross-referenced to the reported accident records to identify the scope for any remedial measures or future action.”*

### **TMS Consultancy (UK)**

#### **Practical Road Safety Auditing (2001)**

This book was written by Steve Proctor, Martin Belcher and Phil Cook – Directors of TMS Consultancy in the UK. In the Preface the authors state:

*“This book attempts to bring [information on safety problems identified by safety auditors] together in a format that the safety auditor can use at a practical level. The book contains many examples of real road safety problems..”*

The majority of this book is devoted to the safety problems identified in the safety audits of new schemes, together with the source data which support the audit recommendations. In the concluding chapter the following remarks are made on the safety audit of existing roads:

*“In many countries the safety audit process is being extended to carry out safety audits on existing roads...In some of these countries the quality of accident data is poor, and reporting levels are low. The safety audit report is therefore used as a proxy for accident data.”*

*“It is interesting to note that Australian road safety auditors now seem to be placing a reduced emphasis on this type of work, after pioneering this type of approach in the early 1990s and safety auditors in North America have also reduced their interest in stage 5 audits.”*

### ***Transit New Zealand and Transfund New Zealand***

#### **Transit New Zealand Safety Audit Policy and Procedures August 1993**

#### **Transfund New Zealand Safety Audit Procedures for Existing Roads December 1998.**

The Transit 1993 manual describes the procedures used on State Highways. These safety audit procedures apply only to audits of new schemes. The manual excludes audits of existing roads.

The Transfund 1998 manual describes the method used by Transfund to audit existing networks. Transfund is the national funding agency and uses the audit to provide an assessment of the safety performance of a road controlling authority. The manual defines the sampling and describes inspection (or audit) of the selected roads. From the data collected on the sample of roads, the audit team identifies the recurring themes and trends. The audit report concentrates on the recurring themes. The team’s recommendations are pitched at a policy level.

### ***Transport Association of Canada***

#### **The Canadian Road Safety Audit Guide Version 4, August 2001.**

The definition is *“A road safety audit is a formal and independent safety performance review of a road transportation project ..”*. The manual concentrates on road projects. However, reference is made to *“in service roads”*

*“In-service road audits .. involve the road owner and the audit team working to identify and mitigate potential collision risks. Whereas the suggestions of planning and design audits can be accommodated by changing design drawings, the suggestions resulting from in-service road audit will often require infrastructure changes.”*

*“An in-service road audit is not typically conducted under significant time constraints, and can range from an audit of a small intersection or short road section to an audit of several thousand kilometres of highway.*

Draft